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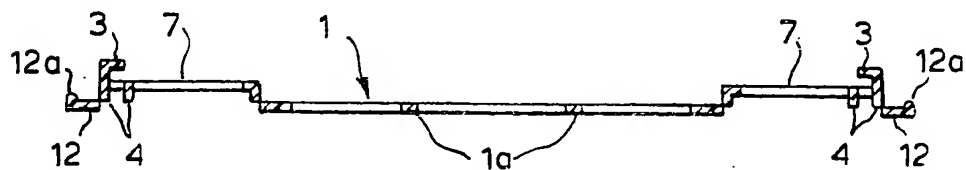
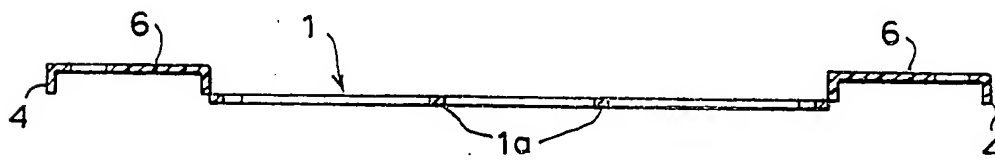
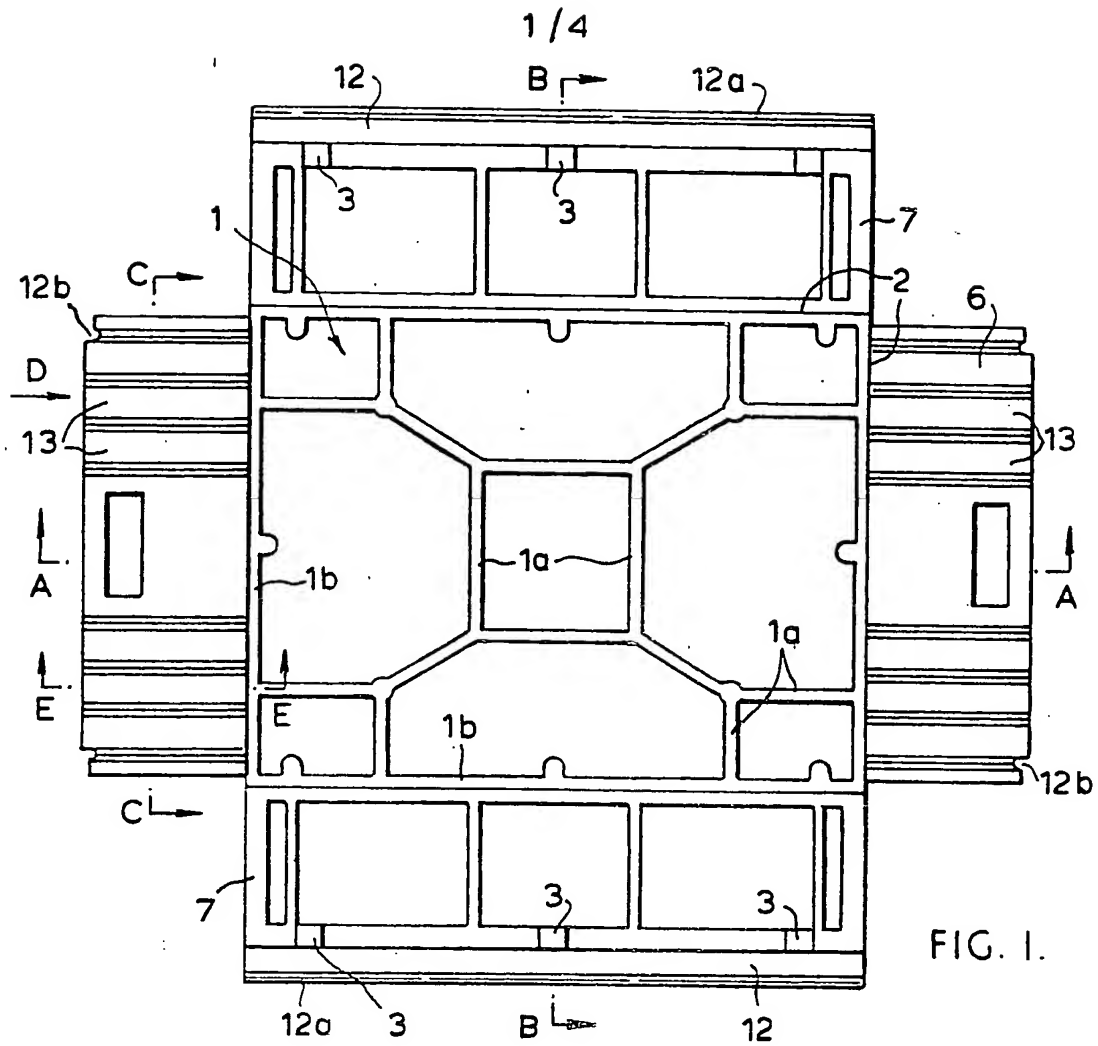
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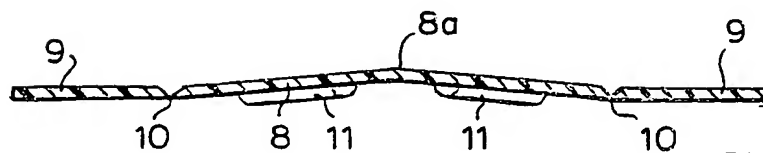
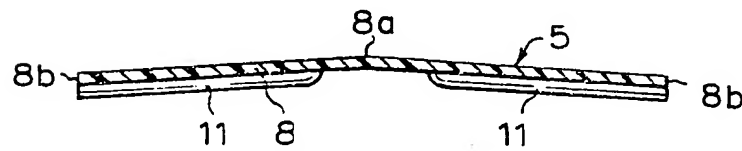
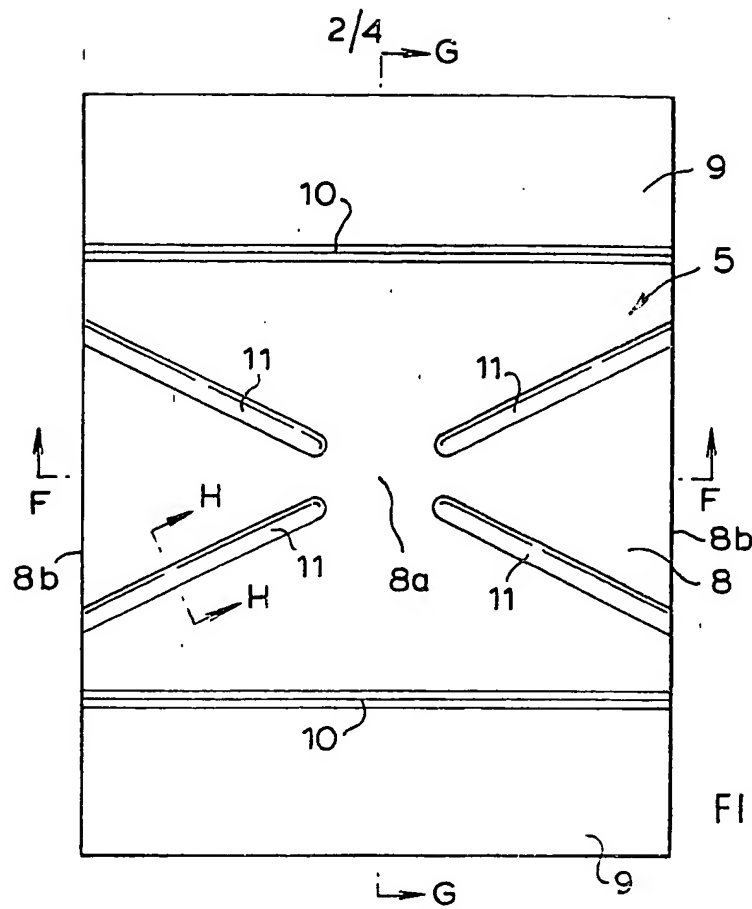
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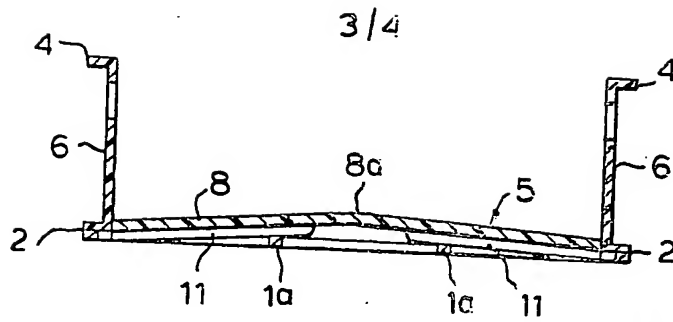


FIG. 8.

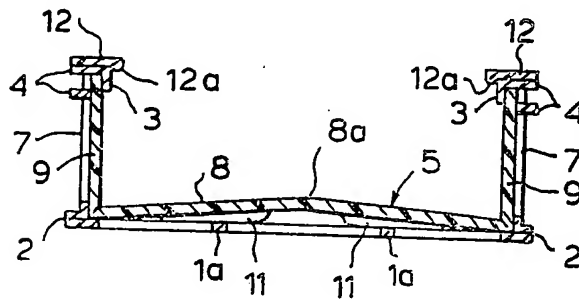


FIG. 9.

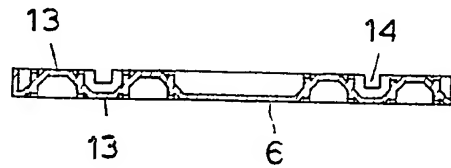


FIG. 10.

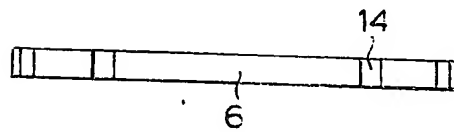


FIG. 11.

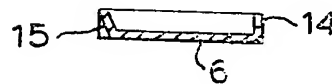


FIG. 12.

FIG. 13.

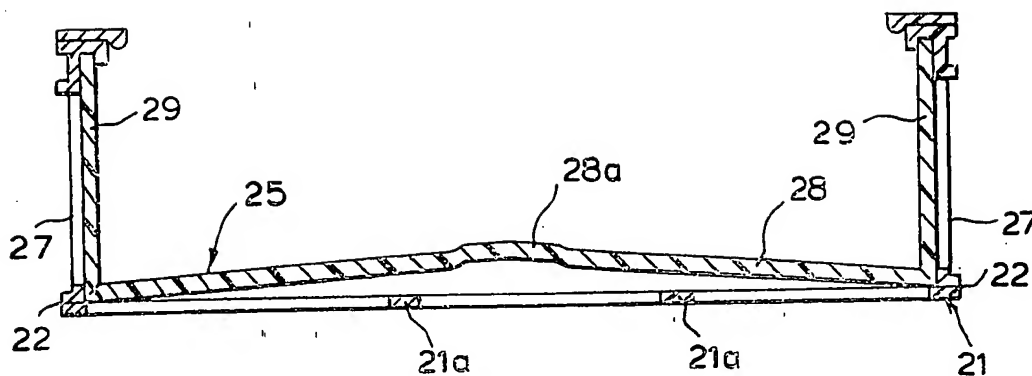
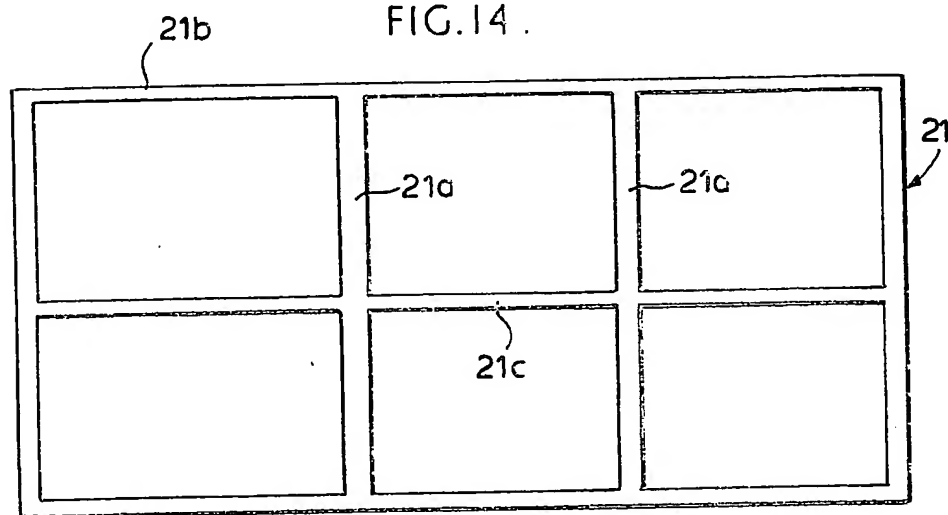


FIG. 14.



## SPECIFICATION

### Crates, and linings therefor

- 5 The present invention relates to crates, especially to crates of the type described and defined in British Patent Application No. 8520495 (GB 2163132A), and in particular to linings therefor. In one application, the invention relates to a folding, stackable  
10 and disposable crate particularly intended for the transport and warehousing of wet fish.

Wet fish is traditionally transported in wooden crates. However, such wooden crates are heavy and unhygienic, and also there is a problem that  
15 liquid from the fish (water, blood, etc) can only drain straight downwards to the bottom of the crate. Wooden crates soak up some of the water which drains to the bottom thereof, and water which drains from the bottom of the crate can only  
20 do so downwards, and not sideways from the crate bottom. Such crates are also expensive to produce and therefore usually have to be cleaned and returned empty to the sender. Because the cost of return carriage of the crates is significantly high,  
25 they are sometimes simply disposed of rather than being returned, which again makes their use expensive. Furthermore, wooden crates have the disadvantage that they provide no thermal insulation of the fish contained therein.

30 Fish are also transported in rigid plastics crates, which overcome some of the disadvantages of the wooden crates. However, the rigid plastics crates still have the disadvantages of being expensive to produce, being heavy, and of having to be steam cleaned prior to re-use. Drainage of liquid to channels at the sides of the crate is sometimes provided, the liquid being usually drained over the sides of a similar crate stacked below. Also, rigid plastics crates do not provide thermal insulation of  
40 the fish contained therein.

In addition, fish may be transported in rigid foamed plastics crates. Such crates may have the advantage that they do thermally insulate the fish contained therein, but on the other hand they do  
45 not provide adequate drainage of liquid from the fish. Such crates are sometimes provided with drainage holes in the bottom thereof, but no provision is made for drainage of liquid sideways from the crate bottom. The drainage holes, when provided, may lead to cracking of the crate if it is dropped or otherwise mis-handled. Rigid foamed plastics crates are also difficult to handle. Also, being rigid, return carriage costs are still high because of the volume occupied by the crates. Furthermore, in order to give the foamed plastics crates sufficient strength to enable them to be stacked, their walls have to be made very thick, and therefore such crates are also expensive to produce.

60 Accordingly one aim of the present invention is to provide a means for conveying wet fish and also other produce where drainage of surplus liquid is desirable, which overcomes the various disadvantages described above.

65 Also, while in general a thermotormed, extruded

foam sheet base or lining for a crate as described in British Patent Specification No. GB 2163132A is sufficient for many applications, it may in some circumstances not support products such as heavy  
70 fruits and vegetables. It is therefore another aim of the invention to provide a base or lining which will support heavy loads.

The present invention provides a crate, which comprises a frame made of plastics material and comprising a base and side walls, the side walls being adapted to be locked together when the frame is erected, and a membrane or lining (hereinafter referred to as a lining) functioning in use to keep the contents of the erected frame within the latter, wherein the base of the lining is arranged to slope downwards from a central area to an outer area thereof.

80 The crate according to the invention may be suitably used for transporting produce where drainage of surplus liquid is desirable, especially wet fish. Alternatively, or additionally, the invention will find application where the crate and especially the lining thereof is to support heavy loads.

85 The side walls of the frame are preferably hinged to the base thereof, for example by integral hinges of plastics material, but alternatively the side walls may be detachably connectable to the base, for example by clips which permit the side walls to be folded relative to the base when the side walls and  
90 base are connected together.

Thus the frame of the crate of the invention may be folded between a first position wherein the base and the side walls thereof lie generally in the same plane and a second, erected, position wherein the side walls are disposed generally transversely, usually perpendicular, to the plane of the base, in which erected position the side walls are locked together, usually interlocked together, to form the erected frame which with the lining thus then constitutes a box for holding the goods such as wet fish.

100 The foldable, stackable crate of the invention is suitable for transporting wet fish at a competitive cost, while avoiding the problems of the prior art as mentioned above, especially the problem of providing satisfactory drainage of surplus liquid.

Broadly the crate of the invention may essentially comprise a skeleton frame and a lining which is supported by the frame.

105 The frame itself may be a solid or open structure, or some parts thereof may be solid while other parts are open. In particular the base of the frame is preferably constituted by a series of interconnecting ribs. Such interconnecting ribs are preferably disposed orthogonally (perpendicular) to the perimeter of the frame. Alternatively, the base of the frame may consist of a perimeter rib only, to which the frame side walls are attached, and it is to be understood that such a frame having a base portion comprising a perimeter only may in certain intended uses of the crate be adequate for the purpose of the invention.

120 The frame is made of plastics material such as polypropylene, while the lining is preferably made of plastics material such as polystyrene, but could



be made of other suitable material such as waxed or oiled cardboard or paper.

The purpose of making the frame as a skeleton is to keep the crate extremely lightweight, and, therefore, of low cost while at the same time giving the crate a certain amount of rigidity for the purposes of stacking.

The purpose of the lining, on the other hand, is to act as a skin to keep the contents of the box formed by the erected frame inside the box and also in certain cases to act, in combination with a suitable lid of the crate, as a thermal insulation to keep the contents of the box at a low temperature during hot weather.

The frame consists of a base and four side walls preferably connected to the base in one piece. This is most preferably achieved through an integral hinge which is a fine section of plastics material which can be bent when the side walls are folded up. The hinge may extend along the whole of the adjacent edges of the base and a respective side wall, but it is preferred that portions only, suitably spaced, of the said adjacent edges are hinged together.

When the side walls are folded up they may be suitably connected to each other at the corners by use of a clip mechanism, preferably by clips provided at the side edges of one pair of opposite side walls engaging corresponding recesses in the side edges of the other pair of opposite side walls.

The lining may be suitably a flat sheet of foamed or thermoformed plastics which is scored or hinged along two lines so that the centre part is approximately the same dimension as the base and the two areas either side are approximately equivalent to the sizes of the long sides of the crate, where the crate base is rectangular. The lining may be suitably a continuous sheet, or alternatively formed with a series of openings therein.

The lining may also be provided with ridges and undulations to give it considerable extra strength, for certain uses of the crate.

When assembling the crate, the lining may be suitably fitted under a clip or clips at the top of the inside of the long sides of the crate. As the long side walls are folded up the lining is wedged between the clips and the inside corners of the crate. Alternatively or additionally, the upper ends of the side wall portions of the lining may be retained by folded back or hinged portions of the upper ends of the frame side walls.

The lining, which for example can be as thick as 6-7 mm, is extremely strong in a vertical plane in terms of compression and can support heavy loads above it, especially in conjunction with the moulded frame.

Since the lining is also locked into the corners of the crate by the wedging action the part of the lining that covers the base is held taut so that heavy loads of fish or of fruits or vegetables will not make the base bow or bend downwards.

As mentioned above, the lining is preferably a foam material which acts as an insulation barrier to keep for example wet fish cool inside. Because it is foamed it is also extremely lightweight (but

nevertheless extremely strong) and therefore it is also of extremely low cost.

It is also envisaged that the lining may continue up past the clips and fold over the top to make a lid for further insulation and to keep the produce covered for security and hygienic purposes. That part of the lining which may be folded over to form a lid may be suitably perforated or scored at the part to be folded over, so that the folded over part may be readily torn off.

For example the lining may be provided with two further portions attached to the two side areas thereof, these two further portions each having a dimension approximately equal to half the centre part of the lining, the two further portions being foldable to form a lid of the crate. Alternatively there could be provided one such further portion only, having a dimension equal to that of the lining centre portion, attached to one side area of the lining and foldable over to form a lid of the crate.

As a further advantage, the crate may if desired be provided with a separate lid.

According to a further alternative embodiment of the invention, the lining may comprise a box having a base and four side walls, generally corresponding to the dimensions of the base and side walls of the frame. Such a lining in the form of a box may be suitably of cardboard or of thermoformed plastics. Such a lining in the form of a box may also be provided with a lid of any of the types described above.

The lining may be printed on the outside and the frame may be designed in such a way that large windows in the long sides allow the printing on the sides of the lining to be visible. Preferably at least one side wall of the frame is provided with such a window opening.

For the purpose of providing drainage of liquid from the produce such as wet fish retained by the lining of the crate, or for supporting heavy loads, according to the invention that part of the lining which lies at the base of the erected frame is arranged to slope downwards from a central area to an outer area thereof. Most preferably the base portion of the lining is bowed upwards in both the lengthwise and widthwise directions thereof to provide a high point at the centre of the base portion. It is further preferred to provide a number of channels extending from adjacent to the high central point of the base portion of the lining to the edges of the lining base portion, for example four channels arranged generally in an X-shaped configuration, to assist the drainage of liquid. Such channels will terminate at the free edges of the lining base portion, i.e., those edges which do not connect to the side wall portions of the lining.

The side walls of the frame which lies adjacent to the edges of the lining where the abovementioned channels terminate may be corrugated to provide drainage channels in the side walls, and such side walls may be provided at their lower ends with drainage openings through which the drained liquid may flow from the bottom of the erected crate. Also, the upper edges of the same frame side walls may be chamfered or sloped

obliquely downwards in the direction towards the outside of the crate so that, when similar crates are stacked one above the other, the liquid flowing out at the bottom edges of an upper crate will pass to the downwardly sloping upper edges of the side walls of the lower crate and thus be discharged.

In producing the crate according to the invention the frame will be most preferably produced by injection moulding and the lining may be applied in an indexed manner as the frame is formed. In this case the base portion of the lining may be pre-punched with one or more holes through which molten plastics is injected during the moulding cycle, thereby securing the lining to the frame as the latter is formed.

The present invention in another aspect provides a base or lining for a crate which has at least one rib in the base portion thereof disposed orthogonally (perpendicular) to the base perimeter or edge, wherein the said base or the base portion of the said lining is formed to slope downwards from a central area to an outer area thereof.

The crate is preferably of the type described in the British Patent Specification No. GB 2163132A, i.e. the crate comprises a frame made of plastics material and has a base and side walls, the side walls being adapted to be locked together when the frame is erected, and a lining functioning in use to keep the contents of the erected frame within the latter, the walls of the frame being hinged to the base thereof preferably by integral hinges of plastics material which can be bent when the side walls are folded up. The lining is formed of a foamed plastics material, more particularly of a thermoformed extruded foam sheet.

The base portion of the crate may have one or more parallel ribs extending in the orthogonal direction and one or more parallel ribs extending in the other orthogonal direction, or a rib or ribs extending in one or the other orthogonal direction only.

In order to create the necessary resistance to heavy loads, the base of a lining may be suitably formed in such a way as to create a dome or upward curve in it. Downward pressure on the curved base creates a horizontal force against the bottom edge of the side walls of the frame or skeleton base of the crate. A rib or ribs in the frame or skeleton base are created to lie in a horizontal plane from one end of the base to the other or one side of the base to the other to prevent the base of the frame or the skeleton from being pushed outwards by the base of the thermoformed foam lining and, as a result, the base of the lining is kept in its upward dome shape thereby supporting the contents of the crate satisfactorily.

A further method to support and maintain the upward dome shape is to create troughs along the length, width or diagonals (or a combination of two or more of these directions) of the base of the lining.

The preferred design of these troughs will be such that the top of the trough will follow the profile of the dome while the bottom of the trough will follow a different profile such as on a plane

similar to the direct line between the bottoms of the side walls. Alternatively the profile of the bottom of the trough might be a larger radius than that of the profile at the top of the trough. A further design could be that the radius at the bottom of the trough could be equal to the radius at the top.

The trough(s) may start and end at the extremities of the inside or of the outside of the base or they may start and end at any point on the base.

The invention will be further described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a plan view of the frame of a crate according to the invention, in the flat or transportable position thereof;

Figure 2 is a section taken along the line A-A in Figure 1;

Figure 3 is a section taken along the line B-B in Figure 1;

Figure 4 is a plan view of the inside of the lining of a crate according to the invention, in the flat or non-folded position thereof;

Figure 5 is a section taken along the line F-F in Figure 4;

Figure 6 is a section taken along the line G-G in Figure 4;

Figure 7 is a section taken along the line H-H in Figure 4;

Figure 8 is a section taken along the same line A-A as in Figure 2 but with the side walls of the frame in the erected position thereof and the lining positioned within the erected frame, the lining being shown along the section F-F of Figure 5;

Figure 9 is a section taken along the same line B-B as in Figure 3 but with the side walls of the frame in the erected position thereof and the lining positioned within the erected frame, the lining being shown along the section G-G of Figure 6 but in the folded position thereof;

Figure 10 is a section taken along the line C-C in Figure 1;

Figure 11 is a view taken in the direction of the arrow D in Figure 1;

Figure 12 is a section taken along the line E-E in Figure 1;

Figure 13 is a side sectional view of another embodiment of a crate provided with a lining according to the invention, in the erected position of the crate;

Figure 14 is a schematic plan view of one form of base portion of the crate shown in Figure 13.

The crate shown in the drawings comprise a frame formed of a base 1 comprising a series of ribs 1a, 1b and four side walls, two of which are short-side walls 6 and two of which are long-side walls 7 which are preferably window walls, i.e., large openings or windows are formed therein. The base 1 and the side walls 6, 7 are made of a plastics material such as polypropylene.

While the ribs 1a may be formed as shown in Figure 1, it is preferred that the ribs are disposed orthogonally with respect to the edges of the base

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While as shown the base 1 comprises a network of ribs 1a connected to a perimeter rib 1b, as mentioned previously in certain circumstances it may be sufficient if the base 1 consists of the perimeter  
5 rib 1b only.

The base 1 is connected to the side walls 6, 7 by integral hinges 2 which are constituted by fine, i.e., relatively thin, sections of plastics material which can be readily bent when the side walls are folded  
10 up to erect the frame. The hinges 2 may extend along the whole length of the adjacent edges of the base and each side wall, but the hinges 2 preferably comprise a series of fine sections of plastics material, suitably spaced apart along the length of  
15 the base and side wall edges.

As shown in Figures 1, 2 and 3, the frame may lie generally flat wherein the base and the side walls are disposed in the same plane. In this position several such crates may be stacked together  
20 for easy transport thereof.

When it is desired to erect the frame into the position shown in Figures 8 and 9, the side walls 6, 7 are simply folded about the hinges 2 into positions in which they are perpendicular to the plane of the  
25 base 1, the side walls being locked together along their vertical adjacent edges by clips (not shown in detail in the drawings) or other suitable fastening means.

Along their edges remote from hinges 2, the side  
30 walls 6, 7 are provided with lateral ribs 4 for strength, as shown. The ribs 4 may in particular prevent the frame from bowing outwards when several crates are stacked one upon the other.

The ribs also serve to assist in stacking erected  
35 crates one upon the other. Further, the upper and lower corners of the erected crate may be shaped to assist stacking.

There are also provided along the side walls 7 clips 3, as shown, for retaining a lining 5 which  
40 forms the other component part of the crate.

The lining 5 is preferably made of a foamed plastics material, such as polystyrene.

The lining 5 is shown in Figures 4 to 7 and comprises a generally flat sheet of foamed plastics  
45 which is scored or hinged along two lines so that the centre part comprises a base portion 8 of approximately the same dimension as the base 1 and the two areas either side comprise wall portions 9 approximately equivalent to the sides of the long  
50 side walls 7 of the crate. The folding of the lining portions 9 relative to the portion 8 is preferably achieved through integral hinges 10 which are constituted by relatively thin sections of material about which the side wall portions 9 can be folded rela-  
55 tive to the base portion 8.

When assembling the crate, the lining 5 is fitted under the clips 3 at the top of the inside of the long side walls 7 of the frame. As the long side walls are folded up the lining 5 is wedged between  
60 the clips 3 and the inside corners of the frame.

The upper ends of the lining side wall portions 9 are also retained by hinged portions 12 provided at the upper ends of the frame side walls 7 and extending back slightly into the crate in the erected  
65 position of the frame. The portions 12 are suitably

hinged to the side walls 7 by hinges similar to the said hinges 2. The hinged portions 12 have detent  
portions 12a for firmly engaging corresponding r-  
cesses 12b (see Figure 1) formed in the frame side  
70 walls 6. The engagement of the hinged portions 12 of the side walls 7 with the side walls 6 gives the erected frame a more rigid structure, and may prevent the frame from bowing outwards under a static vertical load, and also may prevent longitudinal  
75 torsion of the frame.

Thus, when assembling the crate, the lining 5 is located in the erected frame and normally retained therein by means of the clips 3 and hinged portions 12.

80 The lining 5 of the crate will now be described in more detail in relation to the provision of drainage of liquid from the contents of the erected crate, especially wet fish.

As shown in Figures 4 to 7, the base portion 8 of  
85 the lining 5 is bowed upwards in both the lengthwise and widthwise directions thereof to provide a high point at the centre 8a of the base portion. Four channels 11 arranged generally in an X-shaped configuration extend from adjacent the  
90 centre 8a of the base portion to the free edges 8b of the base portion which do not connect to the side wall portions 9 of the lining, the channels 11 being provided to assist the drainage of liquid from the centre 8a of the base portion to the edges  
95 8b thereof.

The side walls 6 of the frame 1 are provided as shown in Figure 10 with a series of corrugations 13, and at certain locations at the lower ends of the  
100 walls 6 are provided drainage openings 14 through which liquid directed by the channels 11 is received and discharged from the bottom of the crate. Liquid may also flow down the side walls 6 along the corrugations 13.

The upper edges of the frame side walls 6 have  
105 chamfered or sloping portions 15 (see Figure 12) inclined obliquely downwards in the direction towards the outside of the crate. Thus when similar crates are stacked one above the other, the liquid flowing out through the openings 14 at the bottom  
110 edges of the side walls 6 of an upper crate will pass to the downwardly sloping portions 15 of the side walls 6 of a lower crate and be discharged from the stack of crates.

Thus when wet fish for example is contained in  
115 the erected crate described above, liquid (water, blood, etc) from the fish flows down to the base portion 8 of the lining 5, along the channels 11 to the edges 8b of the lining base portion, and is discharged through the drainage openings 14 from  
120 the bottom of the crate. When the crates are stacked the discharged liquid is directed away from the lower crates via the sloping edges 15 of the latter.

The crate described above is thus particularly  
125 suitable for containing produce where drainage of surplus liquid is required.

The frame of the crate gives the crate a certain amount of rigidity, while the lining acts as a skin to hold the contents of the erected frame and also to  
130 act, in combination with a suitable lid of the crate,

as a thermal insulation to keep the contents of the crate at a suitable temperature. The lid of the crate may be formed as an extension of the lining as previously mentioned, or the crate may be provided with a separate lid.

The lining, when made of foamed plastics material, can support heavy loads, especially in conjunction with the rigid frame. Since the lining is effectively locked into the crate by a wedging action, the part of the lining that covers the base is held taut so that heavy loads will not make the base bow or bend downwards.

The crate is made lighter in weight by virtue of the skeleton structure of the frame, which is nevertheless cheap to produce, and yet is sufficiently strong to support a load retained in the crate by the lining and by the side walls of the frame.

The inherent strength (tensile strength) of the whole crate structure is essentially improved by the positioning of the lining within the erected frame.

While in the embodiments described above the frame side walls are integrally hinged to the frame base, it is envisaged that the side walls may be detachably connectable to the base, for example by means of clips permitting the side walls to be folded or hinged relative to the base when the side walls and base are connected together.

Figures 13 and 14 show a crate, generally of the type described in British Patent Specification No. GB 2163132A, which comprises a plastics frame having a base portion 21 and side wall portions 27 hinged thereto by means of hinges 22 comprising integral thin strips of plastics material. The crate is provided with a lining 25 of foamed plastics material having a base portion 28 and side wall portions 29. The base portion 28 of the lining 25 is shaped as shown at 25a to have a dome or upward curve in it, in order to create the necessary resistance to heavy loads carried by the crate.

The frame and particularly the base portion 21 thereof is formed as a skeleton frame, as shown in Figure 14. Ribs 21a and 21c extend orthogonally to each other and to the perimeter 21b of the base portion 21. The ribs 21a and 21c lie in a horizontal plane and prevent the base portion 21 from being pushed outwards by the base portion 28 of the lining 25, and as a result the base of the lining is kept in its upward dome shape thereby supporting the contents of the crate satisfactorily.

As will be apparent from Figure 14, the surface distance along the base 28 of the lining 25 from the point of the hinge between the base and one side wall portion 29 to the point of the hinge between the base and the other side wall portion 29 will be greater than the distance between the opposite portions of the base perimeter 21b adjacent the respective side wall portions 29. This relationship will always apply, for the purposes of the invention, for example if the base portion 21 were bowed upwardly instead of lying flat.

#### CLAIMS

1. A crate which comprises a frame made of

plastics material and comprising a base and side walls, the side walls being adapted to be locked together when the frame is erected, and a lining functioning in use to keep the contents of the erected frame within the latter, wherein the base of the lining is arranged to slope downwards from a central area to an outer area thereof.

2. A crate as claimed in claim 1, wherein the side walls of the frame are hinged to the base thereof.

3. A crate as claimed in claim 2, wherein the base of the frame is connected to each side wall by one or more integral hinges of plastics material which can be bent when the side walls are folded up.

4. A crate as claimed in any of claims 1 to 3, wherein the lining is formed of a foamed plastics material.

5. A crate as claimed in any of claims 1 to 4, wherein the lining is scored or hinged along two lines so that a base portion thereof is approximately the same dimension as the base of the frame and two side wall portions thereof either side are approximately equivalent to the sizes of two opposite side walls of the frame.

6. A crate as claimed in any of claims 1 to 5, wherein two opposite side walls of the frame are provided at their edges remote from the base with clips for retaining the edges of the lining.

7. A crate as claimed in any of claims 1 to 6, wherein two opposite side walls of the frame are provided at their edges remote from the base with hinged portions adapted to engage corresponding portions of the other two opposite side walls of the frame in the erected position thereof.

8. A crate as claimed in any of claims 1 to 7, wherein the base of the frame includes one or more ribs disposed orthogonally to the perimeter of the frame.

9. A crate as claimed in any of claims 1 to 8, wherein a base portion of the lining is bowed upwards in both the lengthwise and widthwise directions to provide a high point at the centre of the base portion.

10. A crate as claimed in claim 9, wherein a number of channels extend from adjacent to the said high central point of the base portion to one or more edges of the lining base portion.

11. A crate as claimed in claim 10, wherein four said channels are arranged generally in an X-shaped configuration.

12. A crate as claimed in claim 10 or 11, wherein the said channels terminate at free edges of the lining base portion, and wherein the side walls of the frame which lie adjacent the said free edges of the lining are corrugated to provide drainage channels in the said side walls.

13. A crate as claimed in claim 12, wherein the said frame side walls are provided at their lower ends with drainage openings, and wherein the upper edges of the said side walls are chamfered or sloped obliquely downwards in the direction towards the outside of the crate.

14. A base or lining for a crate which has at least one rib in the base portion thereof, wherein

the said at least one rib is disposed orthogonally to the base perimeter or edge, and wherein the said base or the base portion of the said lining is formed to slope downwards from a central area to an outer area thereof.

15 15. A base or lining as claimed in claim 14, wherein the said base or the said lining base portion is formed with a dome or an upward curve therein.

10 16. A base or lining as claimed in claim 15, wherein the said base or the said lining base portion is formed with troughs, and wherein the tops of the said troughs follow the profile of the said dome.

15 17. A crate, substantially as herein described with reference to, and as shown in, Figures 1 to 12 or Figures 13 and 14 of the accompanying drawings.

20 18. A base or lining, substantially as herein described with reference to, and as shown in, Figures 4 to 9 or Figure 13 of the accompanying drawings.

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